

Claims

- [c1] A method of protecting a material surface comprising steps of
depositing a material layer on said material surface,
said material layer providing an interface selected
from the group consisting of a chemical reaction in-
terface, a grain interface and a material interface,
lithographically patterning said material layer, and
removing said material layer from said material sur-
face selectively to said material surface.
- [c2] A method as recited in claim 1, wherein said material
layer provides a chemical reaction interface and is
formed of a low density and high permeability material
relative to other semiconductor materials and wherein
said depositing step includes converting said material
layer using a plasma containing hydrogen and oxygen or
water vapor.
- [c3] A method as recited in claim 2, wherein said removing
step includes etching said material layer with a mixture
of hydrogen fluoride and a hygroscopic material at a
chemical reaction interface.

- [c4] A method as recited in claim 3, wherein said low density and high permeability material is a tunable etch-resistant anti-reflective coating (TERA) material.
- [c5] A method as recited in claim 3, wherein said hygroscopic material is an organic solvent or an inorganic acid.
- [c6] A method as recited in claim 5, wherein said organic solvent is ethylene glycol.
- [c7] A method as recited in claim 5, wherein said inorganic acid is sulfuric acid
- [c8] A method as recited in claim 1, wherein said depositing step includes depositing a first layer of polysilicon material, exposing said first layer of polysilicon material to an ambient gas to form a said grain interface, and depositing a second layer of polysilicon material.
- [c9] A method as recited in claim 8, wherein said ambient gas includes oxygen.
- [c10] A method as recited in claim 9, wherein said first and second layers of polysilicon material have a total thickness of less than 40 nm.
- [c11] A method as recited in claim 1, wherein said depositing step includes depositing a layer of polysilicon, and

depositing a layer of metal in said layer of polysilicon to form a said material interface.

- [c12] A method as recited in claim 10, wherein said metal is tungsten.
- [c13] A method as recited in claim 11, including the further step of forming a silicide from said layer of metal and said layer of polysilicon.
- [c14] A method as recited in claim 11, including the further step of patterning said layers of metal and polysilicon to form integrated circuit element structures.
- [c15] A mask structure for semiconductor device manufacture comprising a layer of material providing an interface selected from the group consisting of a chemical reaction interface, a grain interface and a material interface, wherein said interface provides at least one of increased resistance to semiconductor manufacturing processes and enhanced selectivity of an etching process for removal of said layer of material.
- [c16] A mask structure as recited in claim 15, wherein said layer of material has OH groups or water incorporated therein.

- [c17] A mask structure as recited in claim 16, wherein said layer of material is a tunable, etch-resistant anti-reflective coating materia
- [c18] A mask structure as recited in claim 16, wherein said layer of material comprises two layers of polysilicon having a grain interface therebetween such that grain boundaries in each layer are interrupted by said grain interface.
- [c19] A mask structure as recited in claim 18, wherein said grain interface is formed of an oxide.
- [c20] A mask structure as recited in claim 15, wherein said layer of material comprises a layer of polysilicon and a layer of metal.
- [c21] A mask structure as recited in claim 20 wherein said metal is tungsten.
- [c22] A mask structure as recited in claim 20, wherein said layer of material is patterned to form a conductive structure in said semiconductor device.
- [c23] A mask structure as recited in claim 22, wherein said conductive structure is a transistor gate.
- [c24] A mask structure as recited in claim 15, wherein said

layer of material includes materials selected from the group consisting of tunable etch-resistant anti-reflective coating (TERA) material, TERA material and polysilicon or nitride, a metal and polysilicon, oxidized polysilicon, nitridized polysilicon and silicided metal.